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TECHNICAL EVALUATION OF THE PROPOSED  
TECHNICAL SPECIFICATION CHANGE FOR THE  
ARKANSAS NUCLEAR POWER STATION, UNIT 2

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Laboratory

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## ABSTRACT

This report documents the technical evaluation of the request for changes in the Technical Specifications for the Arkansas Nuclear Power Station, Unit 2. These changes were proposed by the licensee in a letter dated November 27, 1979. The basis for review included a report entitled "Determination of Plant System Trip Setpoints Valves." The requested changes to the Technical Specifications were found to be acceptable based on information submitted by the licensee.



## FOREWORD

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TECHNICAL EVALUATION OF THE PROPOSED TECHNICAL SPECIFICATION CHANGE  
FOR ARKANSAS NUCLEAR POWER STATION, UNIT 2

(Docket No. 50-368)

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1. INTRODUCTION

In a letter to Arkansas Power and Light, licensee for Arkansas Nuclear Power Station, Unit 2 (ANO-2), dated March 22, 1977 [Ref. 1], the NRC requested explicit information concerning each instrumentation channel trip setpoint value for the reactor protection system (RPS) and for other engineered safety features (ESFs). In Amendment 1 to the ANO-2 operating license, dated September 1, 1978 [Ref. 2], the NRC requested explicit setpoint related information for incorporation into the Technical Specifications.

The licensee's response to the two NRC requests was contained in a letter dated February 28, 1979 [Ref. 3]. This letter also included a report entitled "Determination of Plant System Trip Setpoint Values" [Ref. 4], which provided the requested information and also described the setpoint methodology Combustion Engineering (CE) used to determine the setpoints at ANO-2.

A request to change the ANO-2 Technical Specifications and eliminate the dynamic allowance was submitted by the licensee in its letter dated November 27, 1979 [Ref. 5]. This request is the subject of a separate evaluation report prepared by the NRC, Plant Systems Branch, DOR.



## 2. EVALUATION OF THE PROPOSED TECHNICAL SPECIFICATION CHANGE FOR THE ARKANSAS NUCLEAR POWER STATION, UNIT 2

### 2.1 REACTOR PROTECTION SYSTEM/ENGINEERED SAFETY FEATURES SYSTEM SETPPOINT METHODOLOGY.

The report, "Determination of Plant System Trip Setpoint Values" [Ref. 4], details the methodology used to determine equipment setpoints, allowable values, and drift allowances for each plant protection system (PPS) function.

The equipment setpoint is the trip setpoint value that is actually set into the PPS cabinet during calibration; the allowable value is the limit on the trip setpoint at any time during normal plant operation. The allowable value is checked during a monthly channel function test.

The trip setpoint must be conservative during operation with respect to the allowable value to assure that the equipment will operate as indicated by the safety analysis report. Drift allowance is the difference between the equipment setpoint and the allowable value, and represents the calculated equipment drift that may occur between Technical Specification surveillance tests.

Included in the Combustion Engineering (CE) report [Ref. 4] are the values for the components that are used in total equipment error calculations. The total equipment error is a combination of a random error component and a non-random component, and is calculated after the individual error components have been determined. The total equipment error represents the maximum calculated error that could occur at any time during the periodic calibration interval.

The CE report also gives the margin between the analysis setpoint and the equipment setpoint. This margin is the mathematical difference between the two values. In all cases, the margin between the analysis setpoint and the equipment setpoint is larger than the total equipment error as determined by the setpoint calculations. This margin assures that a trip actuation will occur prior to the point used in the safety analysis.

The ANO-2 reactor protection system uses a core protection calculation (CPC) to generate 2 of the 11 trip signals. The CPC is a digital computer system which uses a method that differs in some respects from the method used for the other trip functions and, therefore, ensures that all equipment uncertainties are accommodated in the decision to initiate a reactor trip. The CE report [Ref. 4] describes the CPC method of uncertainty accommodation in detail.

We have reviewed the methodology for the RPS/ESF instrumentation channel trip setpoint values and acknowledge that the method used for determining the total equipment error is a reasonable technique for determining the trip setpoints and allowable values for the RPS and ESF.

## 2.2 PROPOSED REACTOR PROTECTION SYSTEM/ENGINEERED SAFETY FEATURES SYSTEM SETPOINT VALUES.

We have reviewed the changes to the Standard Technical Specifications for ANO-2 as submitted by Arkansas Power and Light in their February 28, 1979 letter. The values shown in Tables 2.2-1 (RPS instrumentation trip setpoint values) and 3.3-4 (ESFAS instrumentation trip values) were compared with the values for the same functions as listed by Combustion Engineering Company, which accompanied the licensee's submittal of February 28, 1979. We find that with two exceptions these values are identical. These exceptions are as follows:

Exception 1: High pressurizer pressure reactor trip setpoint (Table 2.2-1).

The high pressure reactor trip setpoint [see Ref. 4] is 23 psi higher than that shown in the Technical Specifications.

This increase is due to the elimination of the dynamic allowance. Test data has shown that the instrumentation channel response time is less than assumed in the safety analysis; therefore, the dynamic allowance factor is no longer required and has been removed. A request to change the Technical Specification to eliminate the dynamic allowance was submitted by the licensee in its letter dated November 27, 1979 [Ref. 5].

Exception 2: Refueling Water Tank - Low (Table 3.3-4).

Table 1 in Ref. 4 gives an allowable value of  $> 5.111$  percent to  $< 6.889$  percent for the indicated level. In the Technical Specifications for ANO-2, Table 3.3-4, Item 6b ("Refueling Water Tank - Low") gives an allowable value of between 5.300 percent and 6.886 percent. These values are within the range given in Table 1 of Ref. 4.

We find that the Standard Technical Specifications for ANO-2, as submitted by the licensee, are acceptable with one requested change.



## CONCLUSION

We conclude that the explicit Technical Specification trip setpoint values, the allowable values for the reactor protection system (Table 2.2-1), and the engineered safety features (Table 3.3-4) instrumentation channel trip setpoint values as submitted by the licensee for ANO-2, are acceptable.



## REFERENCES

1. NRC letter (J. F. Stolz) to Arkansas Power and Light (D. A. Reuter), dated March 22, 1977.
2. Arkansas Power and Light, "Amendment 1 to ANO-2 Operating License," dated September 1, 1978.
3. Arkansas Power and Light letter (D. A. Reuter) to NRC (J. F. Stolz), dated February 28, 1979.
4. Combustion Engineering report, "Determination of Plant System Trip Setpoint Values."
5. Arkansas Power and Light letter (W. Cavanaugh) to NRC (R. W. Reid), dated November 27, 1979.



## APPENDIX A



Table 2.2-1. Reactor Protective Instrumentation Trip Setpoint Limits

<u>FUNCTIONAL UNIT</u>	<u>TRIP SETPOINT</u>	<u>ALLOWABLE VALUES</u>
1. Manual Reactor Trip	Not Applicable	Not Applicable
2. Linear Power Level - High		
a. Four Reactor Coolant Pumps Operating	$\leq$ 123% of RATED THERMAL POWER	$\leq$ 123.712% of RATED THERMAL POWER
b. Three Reactor Coolant Pumps Operating	*	*
c. Two Reactor Coolant Pumps Operating - Same Loop	*	*
d. Two Reactor Coolant Pumps Operating - Opposite Loops	*	*
3. Logarithmic Power Level - High (1)	$\leq$ 0.75% of RATED THERMAL POWER	$\leq$ 0.819% of RATED THERMAL POWER
4. Pressurizer Pressure - High	$\leq$ 2368 psia	$\leq$ 2376.887 psia
5. Pressurizer Pressure - Low	$\geq$ 1740 psia (2)	$\geq$ 1686.75 psia (2)
6. Containment Pressure - High	$<$ 18.4 psia	$\leq$ 19.024 psia
7. Steam Generator Pressure - Low	$\geq$ 728 psia (3)	$\geq$ 706.6 psia (3)
8. Steam Generator Level - Low	$\geq$ 46.5% (4)	$\geq$ 45.61% (4)

\*Those values left blank pending NRC approval of ECCS analyses for operation with less than four reactor coolant pumps operating.

Table 2.2-1. Reactor Protective Instrumentation Trip Setpoint Limits (Continued)

<u>FUNCTIONAL UNIT</u>	<u>TRIP SETPOINT</u>	<u>ALLOWABLE VALUES</u>
9. Local Power Density - High	$\leq 20.3 \text{ kw/ft (5)}$	$\leq 20.3 \text{ kw/ft (5)}$
10. DNBR - Low	$\geq 1.3 \text{ (5)}$	$\geq 1.3 \text{ (5)}$
11. Steam Generator Level - High	$\leq 93.6\% \text{ (4)}$	$\leq 94.489\% \text{ (4)}$

TABLE NOTATION

- (1) Trip may be manually bypassed above  $10^{-4}\%$  of RATED THERMAL POWER; bypass shall be automatically removed when THERMAL POWER is  $\leq 10^{-4}\%$  of RATED THERMAL POWER.
- (2) Value may be decreased manually, to a minimum value of 100 psia, as pressurizer is reduced, provided the margin between the pressurizer pressure and this value is maintained at  $< 200 \text{ psi}$ ; the setpoint shall be increased automatically as pressurizer pressure is increased until the trip setpoint is reached. Trip may be manually bypassed below 400 psia; bypass shall be automatically removed whenever pressurizer pressure is  $\geq 500 \text{ psia}$ .
- (3) Value may be decreased manually as steam generator pressure is reduced, provided the margin between the steam generator pressure and this value is maintained at  $< 200 \text{ psi}$ ; the setpoint shall be increased automatically as steam generator pressure is increased until the trip setpoint is reached.
- (4) % of the distance between steam generator upper and lower level instrument nozzles.
- (5) As stored within the Core Protection Calculator (CPC). Calculation of the trip setpoint includes measurement, calculational and processor uncertainties, and dynamic allowances. Trip may be manually bypassed below  $10^{-4}$  of RATED THERMAL POWER; bypass shall be automatically removed when THERMAL POWER is  $\geq 10^{-4}$  of RATED THERMAL POWER.

Table 3.3-4. Engineered Safety Feature Actuation System Instrumentation Trip Values

<u>FUNCTIONAL UNIT</u>	<u>TRIP SETPOINT</u>	ALLOWABLE VALUES
1. SAFETY INJECTION (SIAS)		
a. Manual (Trip Buttons)	Not Applicable	Not Applicable
b. Containment Pressure - High	$\leq 18.4$ psia	$\leq 19.024$ psia
c. Pressurizer Pressure - Low	$\geq 1740$ psia (1)	$\geq 1686.75$ psia (1)
2. CONTAINMENT SPRAY (CSAS)		
a. Manual (Trip Buttons)	Not Applicable	Not Applicable
b. Containment Pressure -- High-High	$\leq 23.3$ psia	$\leq 23.624$ psia
3. <u>CONTAINMENT ISOLATION (CIAS)</u>		
a. Manual (Trip Buttons)	Not Applicable	Not Applicable
b. Containment Pressure - High	$\leq 18.4$ psia	$\leq 19.024$ psia
4. MAIN STEAM AND FEEDWATER ISOLATION (MSIS)		
a. Manual (Trip Buttons)	Not Applicable	Not Applicable
b. Steam Generator Pressure - Low	$\geq 728$ psia (2)	$\geq 706.6$ psia (2)

Table 3.3-4. Engineered Safety Feature Actuation System Instrumentation Trip Values (Continued)

<u>FUNCTIONAL UNIT</u>	<u>TRIP VALUE</u>	<u>ALLOWABLE VALUES</u>
5. CONTAINMENT COOLING (CCAS)		
a. Manual (Trip Buttons)	Not Applicable	Not Applicable
b. Containment Pressure - High	$\leq 18.4$ psia	$\leq 19.024$ psia
c. Pressurizer Pressure - Low	$\geq 1740$ psia (1)	$\geq 1686.75$ psia (1)
6. RECIRCULATION (RAS)		
a. Manual (Trip Buttons)	Not Applicable	Not Applicable
b. Refueling Water Tank - Low	54,400 + 2,370 gallons (equivalent to 6.0 + 0.5% indicated level)	between 51,050 and 58,600 gallons (equivalent to between 5.300% and 6.886% indicated level)
7. LOSS OF POWER		
a. 4.16 kv Emergency Bus Undervoltage (Loss of Voltage)	3120 volts (4)	3120 volts (4)
b. 460 volt Emergency Bus Undervoltage (Degraded Voltage)	423 + 2.0 volts with an 8.0 + 0.5 second time delay	423 + 4.0 volts with an 8.0 + 0.8 second time delay

Table 3.3-4. Engineered Safety Feature Actuation System Instrumentation Trip Values (Continued)

<u>FUNCTIONAL UNIT</u>	<u>TRIP VALUE</u>	<u>ALLOWABLE VALUES</u>
8. EMERGENCY FEEDWATER (EFAS)		
a. Manual (Trip Buttons)	Not Applicable	Not Applicable
b. Steam Generator (A&B) Level-Low	$\geq 46.5\%$ (3)	$\geq 45.61\%$ (3)
c. Steam Generator $\Delta P$ -High (SG-A > SG-B)	$\leq 39$ psi	$\leq 48.35$ psi
d. Steam Generator $\Delta P$ -High (SG-B > SG-A)	$\leq 39$ psi	$\leq 48.35$ psi
e. Steam Generator (A&B) Presssure - Low	$\geq 728$ psia (2)	$\geq 706.6$ psia (2)

- (1) Value may be decreased manually, to a minimum of  $\geq 100$  psia, as pressurizer pressure is reduced, provided the margin between the pressurizer pressure and this value is maintained at  $< 200$  psi; the setpoint shall be increased automatically as pressurizer pressure is increased until the trip setpoint is reached. Trip may be manually bypassed below 400 psia; bypass shall be automatically removed whenever pressurizer pressure is  $\geq 500$  psia.
- (2) Value may be decreased manually as steam generator pressure is reduced, provided the margin between the steam generator pressure and this value is maintained at  $< 200$  psi; the setpoint shall be increased automatically as steam generator pressure is increased until the trip setpoint is reached.
- (3) % of the distance between steam generator upper and lower level instrument nozzles.
- (4) Inverse time relay set value, not a trip value. The zero voltage trip will occur in  $0.75 \pm 0.075$  seconds.

